and that the incapacity for plasmolysis is due to a hardening of the protoplasm. The main evidence for the hardening of the protoplasm is the failure of chloroplasts to be displaced by a centrifugal force of about 1000 gravities, which ordinarily displaces them readily. This process of hardening is reversed (physicochemically and physiologically) by transferring the cells to aluminium-free solutions. The slow rate of reversing leads the author to postulate the tying up of the aluminium in an indiffusible form. It is only in moderate concentrations that aluminium salts produce the effect; in higher concentrations the protoplasm does not harden. Anthocyanin cells cannot be thus hardened, probably due to high sugar content. The author relates this to the fact that non-electrolytes hinder the precipitation of proteins by ions. He also thinks that aluminium salts are specific only in that their low toxicity enables them to bring about such a fundamental physical change in the protoplasm without killing it. While most salts produce such a change, it is not physiologically reversible.—WILLIAM CROCKER.

Individuality of the chromosome.—A four-years' study of the vegetative and reproductive nuclei of *Carex aquatilis* has brought STOUT[46] to the conclusion that the chromosome is an individual organ, maintaining its identity through successive cell generations. He finds that even in resting nuclei the chromosomes are visible as definite bodies which can be counted, and that these chromosomes can be traced through all the stages of vegetative and reduction divisions, except synapsis. Spiremes are formed in both vegetative and reduction divisions, but even in the spirem the individual chromosomes are distinguishable. In the vegetative spirem there is no evidence of any splitting, the longitudinal splitting of the chromosome appearing only after the chromosomes have become arranged in the nuclear plate. In the metaphase of the heterotypic mitosis the chromosomes form a more or less obvious double spirem. The heterotypic mitosis separates whole chromosomes which have been previously paired. Although the study would have been more satisfactory if the stages in synapsis had been more complete, the results form an important addition to the already strong evidence that the chromosome is an individual organ. *Carex aquatilis*, like *Carex acuta* described by JUEL, forms only one pollen grain from a pollen mother cell, the other three aborting at an early stage.—CHARLES J. CHAMBERLAIN.

Seedling anatomy.—HILL and DEFRAINE[47] have worked long enough upon seedling anatomy to have come to some very interesting conclusions. Citing numerous facts that have been used in phylogenetic conclusions, they state that they "see no necessity for preserving seedling anatomy from the fate already meted out to other structural features which were at one time considered as

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[46] STOUT, A. B., The individuality of the chromosomes and their serial arrangement in *Carex aquatilis*. Archiv. Zellforschung **9**:114–140. *pls. 11, 12*. 1912.

[47] HILL, T. G., and DEFRAINE, E., A consideration of the facts relating to the structure of seedlings. Ann. Botany **27**:257–272. 1913.

indicators of phylogeny." "In fact, until more knowledge is obtained with regard to the interrelationship of plant members and the influence of environment—in a word, the influence of physiological necessity on morphological expression—we cannot determine with any degree of certainty the precise value of many anatomical characters." The same disposition is made of the size and number of vascular bundles in connection with the transition phenomena. "Sufficient has been said to show the enormous importance of physiology in questions relating to vascular tissues; for our own part we are strongly of the opinion that no real further advance in our knowledge of morphology, more especially of the higher plants, is possible without an adequate investigation of the physiology of the members concerned."—J. M. C.

Inheritance of quantitative characters.—EMERSON and EAST[48] have discussed this subject rather fully and have presented data bearing upon it secured from experiments with maize. Inheritance was studied in number of rows per ear, length of ear, diameter of ear, weight of seeds, breadth of seeds, and height of plants. The general conclusion is stated compactly as follows: "The results secured in the experiments with maize were what might well be expected if quantitative differences were due to numerous factors inherited in a strictly Mendelian manner. It is quite likely that genetic correlations occur between factors for distinct quantitative characters. These and the physiological correlations so frequently noted make the results more difficult of interpretation, but do not throw them out of the realm of Mendelian phenomena. Physiological correlation is a phenomenon of development, not of inheritance, and as such has less interest for students of genetics than for experimental morphologists. Even in practical plant breeding, correlations of this sort are of importance mainly on account of the physiological or morphological limits that they set to the perfect development of particular combinations of characters."—J. M. C.

The individuality of the plastid.—In a preliminary paper[49] published two years ago, Sapěhin found plastids even in sporogenous tissue, both in monoplastic types, like *Anthoceros*, *Isoetes*, and *Selaginella*, and in polyplastic forms, like the majority of plants. In a second preliminary account[50] he deals principally with *Lycopodium*, which he finds to belong to the monoplastic type; and with *Funaria*, which belongs to the polyplastic type. In the antheridium of *Funaria*, which starts as a polyplastic organ, cell division is not accompanied by any division of the plastid, and consequently the spermatogenous cells soon become

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[48] EMERSON, R. A., and EAST, E. M., The inheritance of quantitative characters in maize. Agric. Exper. Station, Univ. Neb., Research Bull. 2. pp. 120. *figs. 21.* 1913.

[49] SAPĚHIN, A. A., Über das Verhalten der Plastiden in sporogenen Gewebe. Ber. Deutsch. Bot. Gesells. **29**:491–496. *figs. 5.* 1911.

[50] ———, Untersuchung über die Individualität der Plastide. Ber. Deutsch. Bot. Gesells. **31**:14–16. 1913.